



**MAESTRO**  
CONSULTANTS

**NATURAL GAS  
PROCESSING,  
GAS SWEETENING  
&  
SULPHUR RECOVERY**

**COURSE OUTLINE 2020**

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## **TRAINING TITLE**

NATURAL GAS PROCESSING, GAS SWEETENING & SULPHUR RECOVERY

## **VENUE**

Dubai, UAE

## **DURATION**

5 Days

## **DATES**

19 January - 23 January 2020

## **PRICE**

US\$4,000 per attendee including training material/handouts, morning/afternoon coffee breaks and Lunch buffet daily.

## **TRAINING INTRODUCTION**

The Gas and Liquid Contracts that exist (or are being negotiated) will determine the objectives of the processes that you will have to incorporate into any new facility and how you have to operate any existing facility. There exists a variety of processes that will condition your Natural Gas and Hydrocarbon Liquids to satisfy the Contract requirements. The objective of this course is to make you aware of the options available to you so that you can evaluate all the processes that will satisfy your objective to determine which particular process is the best from a capital cost and operating cost perspective.

## **TRAINING OBJECTIVES**

Upon completion of this course, you will gain knowledge of the processes available to process your Natural Gas and Hydrocarbon Liquid Products.

## **TRAINING AUDIENCE**

This course is designed for project managers, plant managers, plant supervisors, technical staff, and contractor personnel involved in project planning, process selection and operation of Natural Gas Production. The greatest benefit arises from considering all the processes that will accomplish your process requirements to determine which one is the best for your particular application from a capital cost and operating cost perspective. You will also be able to see which processes are available to you to de-bottleneck or modify existing processes. The practical

techniques and examples provide useful insights that are valuable at any stage of project execution and operation.

## **COURSE OUTLINE**

### **Gas & Liquid Process Selection**

### **Contract Terms**

### **Basic Consideration**

#### **Gas Contracts**

- Quantity
- Quality
  - Heating Value
  - Sulphur Content
  - Maximum Temperature
  - Water Content (H<sub>2</sub>O Dewpoint)
  - Hydrocarbon Dewpoint (HCDP)
  - Other (N<sub>2</sub>, He, Ar, CO<sub>2</sub>, Hg, O<sub>2</sub>)

#### **Liquid Contracts**

- Commercial Ethane
- Commercial Propane
- Commercial Butane
- Butane-Propane Mixes (LPG)
- Propane HD-5
- Natural Gasoline
- Overall Production System

#### **Solution Gas**

#### **Associated Gas**

#### **Non-Associated Gas**

#### **Gas Processing Module**

#### **Gas Conditioning Module**

- H<sub>2</sub>O Removal (Dehydration)

- H<sub>2</sub>S & CO<sub>2</sub> Removal (Gas Sweetening)
- Nitrogen Removal
- Mercury Removal
- Oxygen Removal

## **NGL Extraction Module**

- Products
- Absorption (Lean Oil)
- Adsorption (HRU)
- Condensation
  - Mechanical Refrigeration
  - Mixed Refrigerants
  - Turbo Expander
  - Twister
  - JT Refrigeration
- Stabilization Module
- Product Treating Module

## **Characterization of Natural Gas & it's Products**

### **Physical Properties of Pure Components**

#### **Ideal Gas Laws**

- Boyle's Law
- Charles' Law
- Avogadro's Principle
- Dalton's Law
- Combined Ideal Gas Law

### **Physical Properties of Mixtures**

#### **Equations of State**

- Van der Waals
- Redlich-Kwong (RK)
- Soave Redlich-Kwong (SRK)

- Peng Robinson (PR)
- Benedict-Webb-Rubin-Starling (BWRS)

## **Thermodynamic Properties**

- Entropy
- Enthalpy

Equilibrium Ratio (K Value)

## **Separation**

### **Types of Separators**

- Horizontal
- Vertical
- Spherical
- Centrifugal
- Cyclone
  - Reverse Flow
  - Axial Flow
  - Recycling
- Filter
- Liquid Coalescer

## **Water Vapour Removal (H<sub>2</sub>O Dewpoint Control)**

### **Water Content**

- HC Liquids
- Natural Gas
- Effect of H<sub>2</sub>S & CO<sub>2</sub>

Hydrate Formation Temperature

- Effect of Propane
- Effect of H<sub>2</sub>S & CO<sub>2</sub>

CaCl<sub>2</sub> Dehydrators

## **MeOH Injection**

## **EG Injection**

## **IFPEX-1**

### **TEG Dehydration**

### **Solid Desiccant Dehydration**

### **HCDP Control**

### **Adsorption (HRU's)**

- 2 TOC
- 2 TCC
- 3 TOC
- 3 TCC
- 3 TOC w/TGC
- 3 TCC w/TGC
- Purge Cycle

### **JT Refrigeration**

- LTX
- LTS

### **Mechanical Refrigeration**

- Variations

### **Twister**

### **Refrigeration Compressors**

- Compression Cycle
- Single Stage
- Single Stage w/Economizer
- Two Stage
- Types
- Drivers

### **Gas Sweetening**

### **Terminology**

### **Safety Precautions**

### **Types of Contaminants**

### **Process Selection**

### **Chemical Reaction Processes**

- Amines
  - Chemistry
  - Typical PFD
  - General Considerations
  - Amines Used (MEA, DEA, DGA, MDEA, TEA, DIPA, Formulated Solvents)
  - Control Variable
- Caustic Wash
  - Chemistry

## **NGL Extraction**

## **Low Temperature Mechanical Refrigeration**

## **JT Refrigeration**

## **Refrigerated JT Expansion**

### **Adsorption (Lean Oil)**

## **Turbo Expander**

- Typical PFD
- Solid CO<sub>2</sub> Formation
- Solid Desiccant Dehydrator
- Inlet Compression
- Gas/Gas Exchangers
- Expander
- Re-Compressor
- De-Methanizer

## **Gas to Liquids**

## **Sulphur Recovery**

## **Claus Plan**

## **Modified Claus Plants**

- Typical PFD – 3 Stage
- Process Considerations
- Mechanical Considerations
- Instrumentation

## Tail Gas Clean-up

- Incineration
- Super Claus 99
- Super Claus 99.5
- SCOT

## Liquid Redox

## **TRAINING CERTIFICATE**

**MAESTRO CONSULTANTS** Certificate of Completion for delegates who attend and complete the training course

## **METHODOLOGY**

Our courses are highly interactive, typically taking a case study approach that we have found to be an effective method of fostering discussions and transferring knowledge. Participants will learn by active participation during the program through the use of individual exercises, questionnaires, team exercises, training videos and discussions of “real life” issues in their organizations. The material has been designed to enable delegates to apply all of the material with immediate effect back in the workplace.